

**CLAIMS**

1.           A method of producing a carbide-containing  
ferroalloy welding consumable material for subsequent use  
5   for producing a hardfacing on a suitable substrate  
comprising the steps of:
  - (a)   forming a homogeneous melt that has a  
10       required concentration of key elements,  
such as carbon, chromium and manganese, for  
a chromium carbide-containing ferroalloy  
welding consumable material; and
  - (b)   forming a solid carbide-containing  
15       ferroalloy welding consumable material from  
the melt.
2.           The method defined in claim 1 wherein step (a)  
comprises forming the homogeneous melt from solid feed  
20   materials.
3.           The method defined in claim 1 or claim 2 wherein  
step (a) comprises forming the homogeneous melt from a  
chromium-containing ferroalloy material.  
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4.           The method defined in any one of the preceding  
claims wherein step (a) comprises forming the homogeneous  
melt from a source of free carbon.
- 30 5.           The method defined in any one of the preceding  
claims wherein step (a) comprises adding graphite to the  
melt to supersaturate the melt with carbon.
6.           The method defined in any one of the preceding  
35   claims wherein step (a) comprises forming the homogeneous  
melt from an iron-containing material (other than a  
chromium-containing ferroalloy) such as scrap steel or

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scrap high chromium white cast iron, to dilute the chromium concentration in the melt.

7. The method defined in any one of the preceding claims wherein step (a) comprises holding the melt temperature for a relatively long time (nominally 30 to 60 minutes) to dissolve carbon in the melt to produce a required concentration of chemically combined carbon in the solid ferroalloy welding consumable material from the melt in step (b).

8. The method defined in any one of the preceding claims comprising de-gassing the melt formed in step (a) so that the solid ferroalloy welding consumable material formed in step (b) facilitates a stable welding arc in a subsequent hardfacing operation and thereby minimises porosity in the resultant hardfacing and eliminates ejection of ferroalloy powder from the weld pool.

9. The method defined in any one of the preceding claims comprising removing slag from the melt formed in step (a) so that the solid ferroalloy welding consumable material formed in step (b) minimises the presence of non-metallic impurities in the resultant hardfacing weld deposit formed in the subsequent hardfacing operation.

10. The method defined in any one of the preceding claims comprising producing a ferroalloy welding consumable material having a chromium/carbon ratio less than 7.0.

11. The method defined in any one of the preceding claims comprising producing a ferroalloy welding consumable material having chromium content in the range 30-65 weight%.

12. The method defined in any one of the preceding

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claims comprising producing a ferroalloy welding consumable material having a chemically combined carbon content greater than 7.5 weight%

5 13. The method defined in any one of the preceding claims wherein step (b) comprises casting the melt into a suitable mould(s) or other casting means and thereafter breaking up the cast product into a suitable form, such as powder form.

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14. The method defined in any one of claims 1 to 12 wherein step (b) comprises atomising the melt with a suitable gas, such as argon, to form solid powder from the melt.

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15. A chromium carbide-containing ferroalloy welding consumable material produced by the method defined in any one of the preceding claims.

20 16. The material defined in claim 15 wherein the chromium/carbon ratio is less than 7.0.

17. The material defined in claim 15 or claim 16 wherein the chromium content is in the range 30-65 weight%.

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18. The material defined in any one of claims 15 to 17 wherein the chemically combined carbon content is greater than 7.5 weight%.

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19. A method of producing a hardfacing weld deposit on a suitable substrate comprising forming a weld pool of the chromium carbide-containing ferroalloy welding consumable material defined in any one of claims 15 to 18 and a welding wire material on a substrate and thereafter depositing a hardfacing weld deposit of material from the weld pool on the substrate.

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20. A hardfacing weld deposit on a suitable substrate produced by the method defined in claim 19.
- 5 21. The weld deposit defined in claim 20 comprising a chromium/carbon ratio of less than 7.0.
22. The weld deposit defined in claim 20 or claim 21 comprising a chromium content of less than 35 weight%.
- 10 23. The weld deposit defined in any one of claims 20 to 22 comprising a combined carbon content greater than 4.0 weight%.
- 15 24. The weld deposit defined in claim 23 comprising tungsten and/or vanadium and/or titanium and/or molybdenum and/or niobium and/or boron up to a maximum of 15 weight%.